DOCUMENT RESUME

ED 129 858 TM 005 538

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TITLE An Evaluation of Five Years of Experience in Interdisciplinary Teaching in a Medical School.
PUB DATE Apr 76
NOTE 10p.; Paper presented at the Annual Meeting of the American Educational Research Association (60th, San Francisco, California, April 19-23, 1976)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Course Evaluation; *Curriculum Evaluation; *Curriculum Planning; *Curriculum Problems; Departments; *Interdisciplinary Approach; *Medical Education; Medical Schools; School Organization; *Teaching Methods
IDENTIFIERS *University of Texas Medical Branch

ABSTRACT

The University of Texas Medical Branch instituted a series of interdisciplinary courses as part of a major curriculum reform in September, 1970. After an evaluation of this change, some general trends were discovered, such as the dependence of course effectiveness on the quality of the course leadership; the need for more logistic and consultantive support; the need for the development of syllabi to coordinate lectures given by a group of faculty members; and the possibility for experimentation with new techniques for education and evaluation. Many of these new techniques have also been adopted in the disciplinary courses. Student comments and item analysis of all examinations are currently being used to gain insight into the effectiveness of the program. (BW)

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ED129858

April 1976

AN EVALUATION OF FIVE YEARS OF EXPERIENCE IN INTERDISCIPLINARY TEACHING IN A MEDICAL SCHOOL

Harold G. Levine

Introduction and Objectives

Interdisciplinary teaching has been a widely utilized technique in a number of health professional schools for the last two decades. In many cases, attempts at interdisciplinary teaching inaugurated with great enthusiasm are quietly dropped a few years later. The objective of this paper is to use the history of the development and refinement of interdisciplinary teaching at The University of Texas Medical Branch (UTMB) to present some basic suggestions on how such activities might be organized to maximize the possibility that they will successfully accomplish their instructional goals. Each of the courses discussed could be the subject of a separate paper. However, there are advantages in discussing them as a group, since they share many common problems.

Perspectives on the Issues Involved

There are excellent reasons for utilizing functional or interdisciplinary teaching in a medical school. Some of the most persuasive are: (1) Subjects taught from a disciplinary point of view are often artificially fragmented, inhibiting understanding and appreciation on the part of the student. (2) Disciplines are arbitrary organizations of knowledge which rapidly become outdated. New formulations (e.g., cell biology) have to struggle for identity against older organizational patterns. (3) Basic science concepts seem isolated and irrelevant to the student without clinical application. (4) The basic science educator needs interaction with clinical scientists to decide on teaching priorities and to obtain examples of clinical application which add vigor to his presentations.

There are also some difficult problems in such teaching which, although less publicized than the advantages, are nevertheless real. These include:

(1) Dilution of the authority of departmental chairmen, since interdisciplinary courses are necessarily under the jurisdiction of a separate authority structure within the institution. Such dilution of authority is often fought by chairmen for reasons which are both appropriate (inability to plan adequately the use of resources) and inappropriate (loss of autonomy, loss of influence) from the standpoint of institutional goals.

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(2) Since the director of an interdisciplinary course often lacks authority to provide promotions and amenities (e.g., space, equipment) to faculty, he can have difficulty in motivating them to spend the necessary time and effort.

(3) Lack of coordination and cooperation among those who use different vocabularies and value different aspects of an area of learning.

(4) Lack of logistical support for functions outside of a departmental structure.

(5) Lack of an organizing principle or conceptual framework to support functional teaching.

The University of Texas Medical Branch Program

Despite the problems described above, some of which were anticipated and some of which were not, UTMB was sufficiently persuaded of the merits of interdisciplinary teaching to inaugurate a series of interdisciplinary courses as part of a major curriculum reform in September 1970 (see Table 1). The UTMB curriculum is described in Table 2.

Methods of Evaluating the Interdisciplinary Courses

Ideally, a curriculum should be evaluated by determining whether or not the students have accomplished specified objectives. Like most health professional schools in 1970, the objectives of the curriculum and of each course were expressed in very global terms which did not permit such analysis. Furthermore, UTMB did not require students to pass the Part I Examinations of the National Board of Medical Examiners (NBME) until 1972. The curricular revision of 1970 did establish an Office of Research in Medical Education, which was charged with evaluating the new curriculum, with especial emphasis on the interdisciplinary courses.

The main methods of evaluating the courses have been to analyze the learning experiences from the standpoint of congruence with basic principles of instructional planning and implementation. Some of the questions asked are the following: (1) Are there objectives? (2) Are learning experiences designed that can conceivably reach the objectives? (3) Is the course well managed? (4) Are the evaluation methods measuring more than simple factual recall? (5) Is attention paid to individual differences? (6) Are the lectures, handouts and conferences well developed and managed? (7) Are the units of instruction articulated with each other? (8) Do the course managers have good rapport with students?

In recent years, these questions have been supplemented with analyses of internal examinations and the results of the National Board Examinations.

TABLE 1

DESCRIPTION OF INTERDISCIPLINARY COURSES AT THE UNIVERSITY OF TEXAS MEDICAL BRANCH AT GALVESTON, TEXAS AS OF 1975-76

Course	When Taught	No. of Hours	Comments
Cell Biology	2nd trimester of freshman year	45	Includes cell anatomy, cell physiology, genetics, and clinical applications relating to these areas of knowledge.
Neurosciences	2nd trimester of freshman year	93	Includes neurophysiology, neuroanatomy, neurochemistry, neuropathology and clinical applications relating to the central nervous system.
Integrated Functional Laboratory	2nd trimester of freshman year and 1st trimester of sophomore year	72	24 experiments in biochemistry, physiology, cell biology, neurosciences and pharmacology.
Introduction to Patient Evaluation	All three trimesters of freshman year	130	Psychology and sociology related to medicine with emphasis on interpersonal skills involved in interviewing and assessing patients, psychiatric defense mechanisms, human growth and development and human sexuality--conducted by clinicians from all clinical departments, and psychologists and sociologists who are faculty members.
Endocrinology	3rd trimester of freshman year	75	Anatomy, biochemistry, physiology, pharmacology, pathology, and clinical applications relating to the endocrine system.
Immunology	Part of 3rd trimester of freshman year	31	Taken from pathology and microbiology time; grading included with those courses. Includes those disciplines plus anatomy, biochemistry, and clinical applications relating to immunological diseases.
Medical Ethics	Either 2nd or 3rd trimester of freshman year	15	History and philosophy of medical ethics conducted by medical historians and medical philosophers--new course in 1974.
Introduction to Clinical Medicine-I	1st trimester of sophomore year	15	Teaches physical examination. Conducted by clinical departments. Much use made of senior medical students as instructors.
Introduction to Clinical Medicine-II	10-week block during sophomore year	290	Conducted by clinical departments. Mornings: presentation of basic clinical concepts. Afternoons: practice in obtaining historical and physical examination information from patients.

TABLE 2

CURRICULUM AT THE UNIVERSITY OF TEXAS MEDICAL BRANCH
Galveston, Texas

YEARS

Freshman	Sophomore	Junior	Senior
Gross and Micro-anatomy	Pharmacology	Clerkships in:	40 weeks of elective tracks
Biochemistry	Preventive Medicine and Community Health	Medicine	15% of the class graduate at the end of the junior year
*Introduction to Patient Evaluation	Pathology	Surgery	
*Neurosciences	*Integrated Functional Laboratory	Pediatrics	
Physiology	*Introduction to Clinical Medicine-I	OB-Gyn.	
*Cell Biology	*Introduction to Clinical Medicine-II	Neuropsychiatry	
*Integrated Functional Laboratory		Lectures in:	
*Medical Ethics		Clinical Subjects	
Pathology		Anesthesiology	
Microbiology		Otolaryngology	
*Endocrinology		Neurology	
		Dermatology	
		*Medical Jurisprudence	

*Interdisciplinary Courses

Data regarding these issues were gathered by student questionnaires, review of instructional materials, interviews with faculty, and results of local and national tests. During the last year the review process has been formalized, and each course director in the medical school has been asked to appear before faculty committees to answer questions similar to those listed above. These data are extremely difficult to quantify. The sophomore class in 1974 did a study comparing all of the courses in basic science in regard to their use of objectives. Their reaction to the interdisciplinary courses was varied, but none of them were rated as unacceptable, as were several disciplinary courses (see Table 3).

Results of the Initial Evaluations in 1971

Basic Science Courses

In 1971, the initial evaluations for the basic science courses were quite diverse. One basic science course was very well received by both students and faculty. The other basic science courses encountered significant problems. Most of these problems seemed to relate to course structure and organization, and the interpersonal conflicts within the course committees over considerations of educational "territory." Furthermore, some course coordinators had difficulty in obtaining commitment from the faculty to work on the course because of a perceived lack of rewards for such participation. Ineffective "team building" in developing the courses caused the courses to appear confusing and disorganized to concerned faculty and students. Often the confusion was such that students and faculty expressed the opinions that the material taught was trivial and unimportant. Some of the course coordinators were inexperienced in the activities required to maintain a major course. The fact that the courses existed in a limbo between the Office of the Dean of Medicine and the departments often made secretarial and clerical support difficult to obtain. Sometimes the syllabus material and examinations were badly edited and replete with typographical errors.

The Integrated Functional Laboratory course was well organized and had strong logistical support. The acceptance of this course seemed to be a direct function of the individual laboratory experiments. Students liked some experiments and disliked others.

Clinical Courses

The course in Introduction to Clinical Medicine-II (see Table 1) was very well received by the students. The course coordinator was gratified by the reception of the course, but he was disturbed about the gap between what he wanted the students to be able to accomplish and what, in fact, they were able to do at the conclusion of the course. Furthermore, the course put an extraordinary burden on the patient population at UTMB who had to interact with medical students from the freshman and sophomore years, as well as the junior and senior years.

At that time, the course in Introduction to Clinical Medicine-I was different from the present course described in Table 1. It consisted of one to two hours a

TABLE 3

STUDENT REACTION TO COURSE USE OF OBJECTIVES

	1	2	3	4	5	6	
	Clarity of Course Goals or Objectives	Effort to Communicate Course Goals or Objectives	Effective Use of Objectives on Lecture Orientation and Learning Activities	Degree the Evaluation Procedures (Tests) Assess Attainment of the Stated Objectives of the Course	Extent that Course Facilitated Development of Competence in this Area	Effort this Course Made to Facilitate Competence in this Area	Mean
A	2.8	2.7	2.5	2.8	2.9	3.0	2.8
*B	3.2	3.1	2.9	3.4	3.3	3.3	3.2
C	1.7	1.5	1.6	1.9	1.8	1.6	1.7
*D	2.8	2.6	2.7	2.9	3.1	2.8	2.8
E	3.9	3.9	3.8	3.6	3.9	4.3	3.9
*F	3.9	3.8	3.6	3.8	3.6	3.5	3.7
*G	2.6	2.6	2.5	2.3	2.6	2.9	2.6
*H	2.7	2.7	2.5	2.1	2.7	2.8	2.6
*I	2.6	2.8	2.6	2.3	2.5	2.9	2.6
J	2.2	2.0	2.0	2.2	2.3	2.0	2.1
K	2.6	2.4	2.3	2.4	2.4	2.6	2.5
*L	3.3	3.4	3.3	3.5	3.5	3.7	3.5
M	4.0	4.1	3.5	2.9	3.6	3.9	3.8
N	3.2	3.0	2.9	2.9	3.4	3.2	3.1
O	2.6	2.5	2.5	2.5	3.0	2.8	2.7
P	1.5	1.5	1.4	1.3	1.5	1.6	1.5
Overall Mean	2.9	2.8	2.7	2.7	2.9	2.9	2.8

Key for Mean Values: 1=Unacceptable; 2=Poor; 3=Adequate; 4=Good; 5=Excellent

*Interdisciplinary Courses

N=182 out of 196 students=93% response rate

week throughout the basic science years, with eight students and one clinician. In this course, the faculty member had the students work with patients. Supposedly, the patients presented with conditions that were being discussed in basic science, since one of the major objectives of the course was the integration of basic science teaching with clinical problems. The effectiveness of this experience, like most others involving small groups, was dependent on the effectiveness of the group leader. In general, the students found the experience gratifying. The faculty enjoyed student contact, but found themselves getting "stale" after meeting with the students for many months and began to resent the time commitment. Further, analysis by the course coordinator indicated that the course was not meeting its objective of coordination with basic science because the faculty rarely had time to find out what was being covered in the basic science courses and to plan student activities accordingly. Also, the course put an additional burden on the patients at UTMB. The course was eventually combined with Introduction to Patient Evaluation (see Table 1), with the exception of one 15-week term in which the students are introduced to the physical examination procedures on each other under the direction of senior medical students.

The Introduction to Patient Evaluation course was initially designated as a course in behavioral science, with emphasis on such topics as human growth and development. The initial evaluations of the course by students were very dismal. The faculty had a reasonably clear idea of their global objectives, but they were not at all satisfied that the course was achieving these objectives. One problem was that the course had no learning experiences which required application of the principles being taught--the equivalent of patient contact in the clinical years and laboratory in the basic science years. Eventually, the Behavioral Science course adopted interviews with simulated patients as their equivalent of laboratory experiences, and the Behavioral Science course and the course in Introduction to Clinical Medicine-I were integrated into a new course called Introduction to Patient Evaluation (see Table 1).

Effects of the Initial Evaluations

Some of the effects have been discussed above, but a few general trends should be emphasized.

(1) Since the effectiveness of an interdisciplinary course is greatly dependent on the course leadership, the course coordinators and members of course committees have been changed when the conditions seem to warrant such action.

(2) It became readily apparent that the interdisciplinary courses needed more logistical and consultative support than had been available. A new position of Associate Dean for Curricular Affairs was established that had as one of its principal responsibilities the provision of logistical and consultative support to the interdisciplinary courses. Members of the Office of Research in Medical Education, who had been functioning informally as resource persons to many of the courses, were made ex officio members of all of the committees. In some cases, the staff of the Office of Research in Medical Education became active participants in the program.

(3) Even in disciplinary courses, the tendency has been to allocate sections of courses to individual faculty. Since faculty often fail to attend each other's lectures,

lecture-taught courses can become confusingly fragmented and discontinuous. These difficulties are compounded when the faculty consists of representatives from a number of disciplines. In response to the dangers of fragmentation, the interdisciplinary courses at UTMB have all developed course syllabi. Many of these syllabi have been subject to extensive peer and editorial review. Some of them consist of self-instructional units with objectives, practice questions and post-tests. [1]

(4) The faculty have become more aware of the need to provide some means of practice and feedback within the lecture-syllabus system. Therefore, practice examination questions have been included as a part of most courses, and some curriculum time is spent discussing the answers to the questions.

(5) The clinical courses, Introduction to Patient Evaluation and Introduction to Clinical Medicine-II (see Table 1), have been experimenting with new techniques for education and evaluation. These include the use of simulated patients to teach interviewing skills; videotapes and simulated patients to teach physical examination skills; motion pictures on human sexuality; and written simulations to teach and evaluate problem-solving abilities.

(6) Student comments are being used increasingly to improve specific learning experiences rather than global judgments regarding an entire course. Such comments have been especially helpful in improving the individual laboratory experiments in the Integrated Functional Laboratory course.

(7) All of the examinations in the courses, and all others as well, are computer scored and item analyzed. These item analyses are used to gain insight into the effectiveness of the educational program and the examination questions.

(8) Part I and Part II Examinations of the NBME are required for graduation. Most of the interdisciplinary courses at UTMB cover more than one subject matter examination so that the total scores are, for the most part, of little help, but the NBME individual items and their statistical analysis are useful because they indicate the priorities of a national group and they provide data on the performance of local students compared to students from other institutions. These data are used to alter the present curriculum or to provide students with self-study materials over areas of competence sampled by the NBME but not dealt with by the present UTMB curriculum.

Effects of the Interdisciplinary Courses on the Entire UTMB Program

The activity in behalf of the interdisciplinary courses at UTMB, undertaken by the Office of the Dean of Medicine and the Office of Research in Medical Education, has also substantially influenced the disciplinary courses at UTMB. They, too, have adopted syllabi, item analysis, practice questions, student evaluations, etc.

Furthermore, the position of the course coordinator, as defined by the interdisciplinary course committees, has been adopted by most of the disciplinary courses. Many of the disciplinary courses have invited clinicians and basic scientists from other departments to participate, so that these courses have taken on many of the

characteristics of interdisciplinary courses.

One of the continual unresolved problems has been the relationship between a faculty member's commitment to his department and commitment to the interdisciplinary courses. Conflicts over this relationship often led to a decline in commitment to the interdisciplinary courses. Furthermore, as the years passed, the disciplinary courses began to teach some of the material allocated to the functional courses. It was evident that there needed to be some faculty body to review the interface between the disciplinary courses and the interdisciplinary courses. An ad hoc Coordinating Committee for the Basic Science Core was established to deal with questions regarding the relationship among courses. This committee's function was later broadened to include responsibility for evaluating all courses in the basic science year, and another committee was appointed to perform similar functions for the clinical courses. These committees have functioned by asking the questions given in the methods section of this paper. The reports of these committees have helped to improve the existing courses, and are serving as a data base for consideration of basic curriculum changes that may be needed further to improve the functioning of the entire curriculum.

Future Progress and Implications for Medical Education

As this brief review indicates, the development of interdisciplinary courses requires that extensive efforts be made to deal with the administrative problems that inevitably will arise when a new method of organization is developed within an existing organizational system. If these problems are addressed, then such courses can make a very effective contribution to health professions education.

Since their inauguration in 1970, the interdisciplinary courses have become well accepted at UTMB, and a new course in medical ethics has been developed using the same model. From continued discussion of the model, however, the point was raised that interdisciplinary cooperation and collaboration should not necessarily require the development of a formal course, even though such cooperation was deemed desirable. Those teaching within the existing courses can coordinate their teaching along functional lines without forming a separate course. Such a system is being implemented at UTMB in the teaching of oncology.[2] Eventually, the distinction between disciplinary and interdisciplinary courses may disappear and the entire basic science curriculum at UTMB may be conceived as a single course consisting of multiple units of instruction.

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